TORVOSAURUS

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INTRODUCTION

This presentation introduces the discovery of a gigantic predatory dinosaur skeleton: *Torvosaurus*. Despite its spectacular size, due to its poor fossil record it is one of the rarest Jurassic dinosaurs. As a result, little has been presented in scientific literature and museum exhibitions, and, therefore, *Torvosaurus* endures public unawareness. *Torvosaurus* is a theropod previously known only from tooth sheds, unassociated bones, and fragments. The first-published *Torvosaurus* remains were discovered in the Dry Mesa Quarry, Montrose County, Colorado. The principle specimen (holotype) that bears the name is an isolated humerus and exemplifies the paucity of material known. Hence, up to now, there has been no associated skeletal material from a single individual available to examine and characterize this little-known species. Because of its size and unique morphology, its study is important to help understand the evolutionary history of theropods, and the impact *Torvosaurus* may have had in the Jurassic world as an apex predator.

Torvosaurus skull

The unusually robust bones of this new *Torvosaurus* skeleton are unquestionably from a single individual, as they were found partially articulated or closely associated within a restricted area (see quarry map). The specimen is a partial skeleton (see osteograph), however, it is sufficiently complete to characterize the animal by comparison with *Allosaurus*. It is the most complete *Torvosaurus* specimen, and one of the best Jurassic megalosaurid skeletons discovered; thus, the research potential is enormous.

The *Torvosaurus tanneri* skeleton makes for a prestigious and exciting "never-before-seen" museum centerpiece. It was excavated and preserved in the most careful paleontological manner, including full documentation in photographs, maps, and field notes, which are available for inspection upon request. Furthermore, letters and legal documents attesting to the ownership of the property wherein the fossil was discovered are provided within the complete offering. The fabulous *Torvosaurus* skeleton was reconstructed using casts of known *Torvosaurus* bones from the BYU collection, including other examples from the type locality. The mounted 40-foot skeleton is custom fitted with a steel armature designed to allow easy removal of individual bones.

Torvosaurus
left femur

PALEONTOLOGY

Superorder Dinosauria
Order Saurischia
Suborder Theropoda
Family Megalosauridae
Genus *Torvosaurus*
Included Species: *T. tanneri* and *T. gurneyi*, Hendrickx & Mateus, 2014 (Lourinhã Formation, Portugal)
Species *Torvosaurus tanneri*, Galton & Jensen, 1979
Nicknamed Elvis

LOCALITY

Skull Creek Quarry is located in Moffat County, Colorado, approximately ten miles east of the town of Dinosaur, Colorado, and nine miles south of Dinosaur National Monument. This locality is a private property site.

FORMATION

Morrison Formation

AGE

Late Jurassic Period (Kimmeridgian to early Tithonian), approximately 150-155 million years ago.

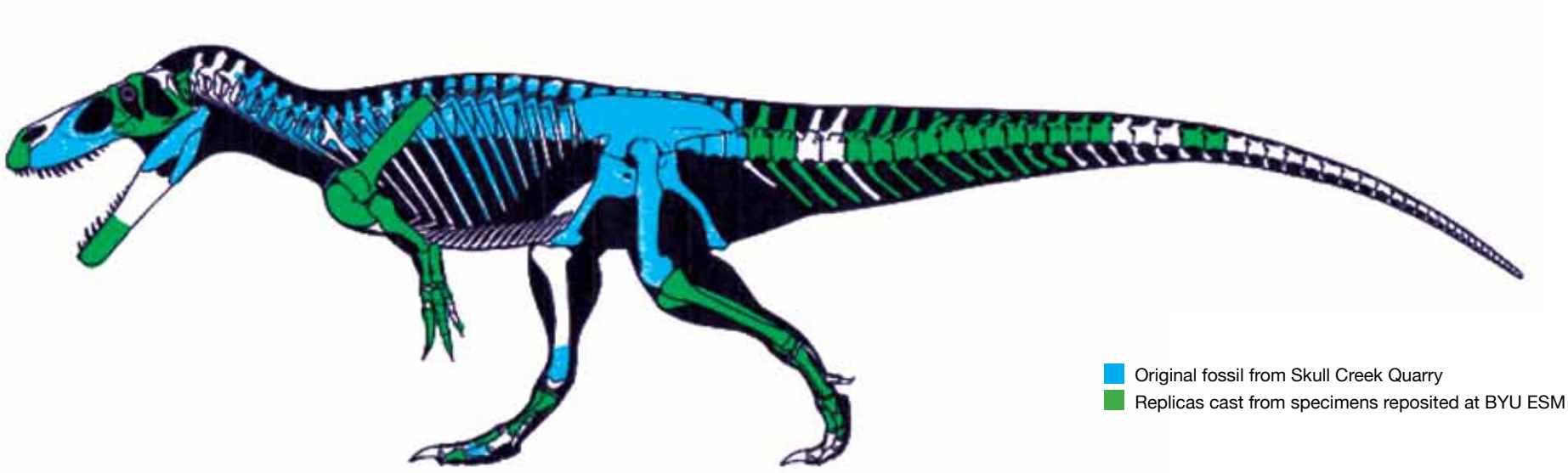
PALEOFAUNA

The Skull Creek Quarry is a multitaxon site that has produced, in addition to *Torvosaurus*, the following megafauna: *Allosaurus*, *Marshosaurus*, *Coelurus*, *Ceratosaurus*, *Diplodocus*, *Camarasaurus*, and *Othneilosaurus*, as well as the crocodylomorph *Goniopholis* and various fishes and turtles.

OSTEOLOGY

Osteograph indicating the bones belong to the new *Torvosaurus* skeleton: numerous teeth from the maxillae, premaxillae, and possibly the dentaries; left maxilla; perfectly articulated left surangular, angular, and articular; most cervical verte-

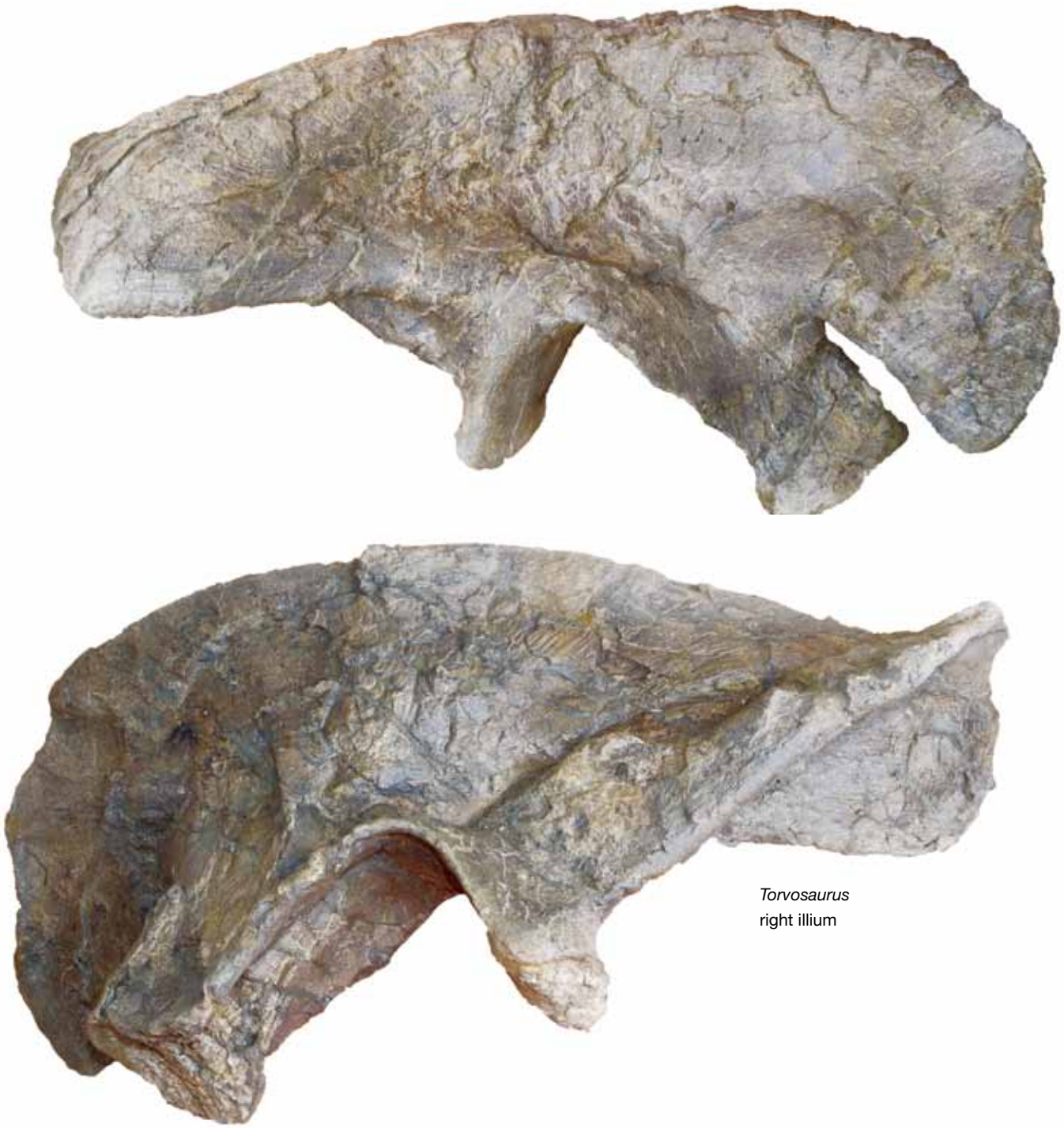
Torvosaurus
left femur



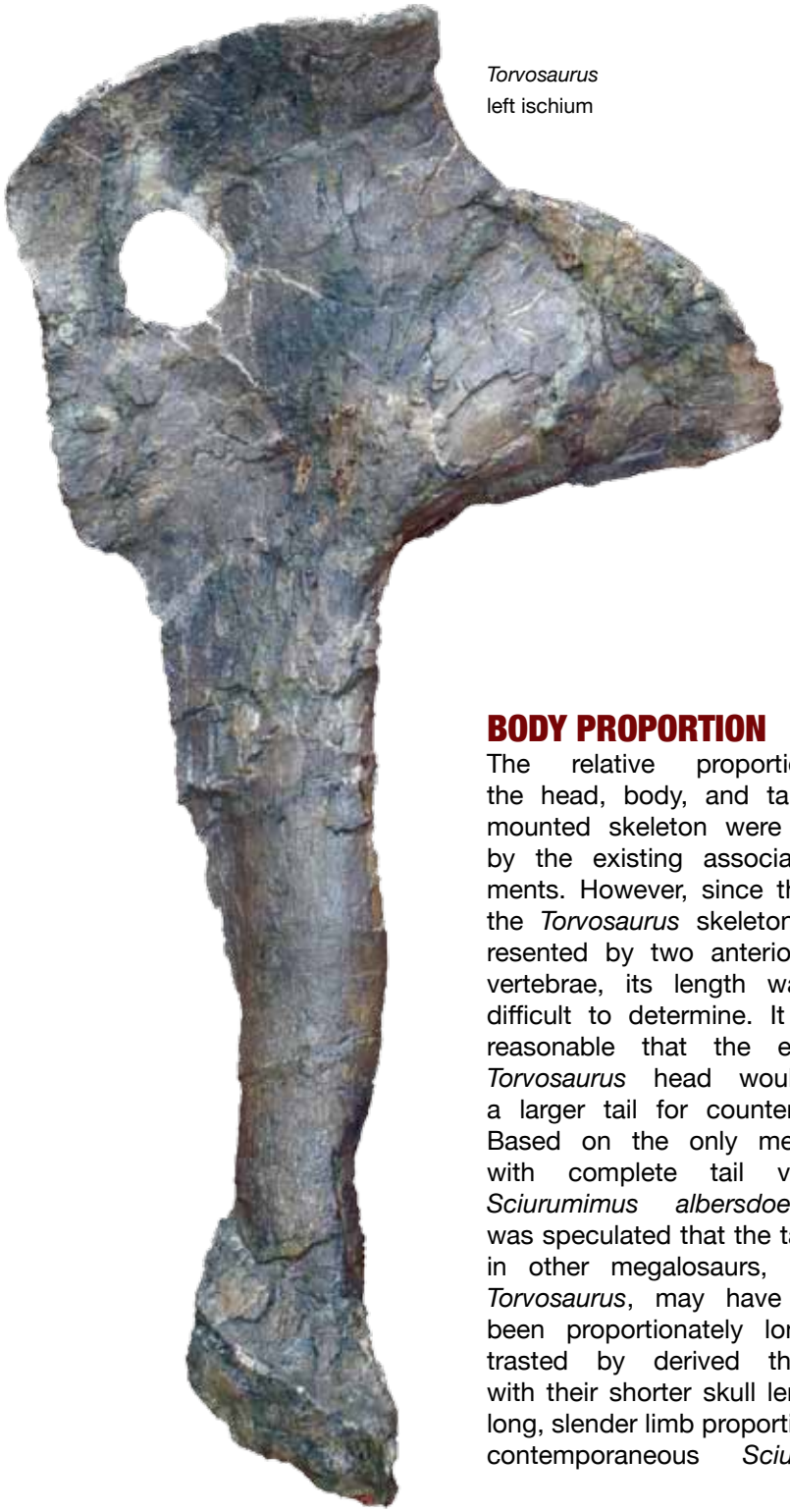
brae; complete dorsal and sacral vertebrae; some caudal vertebrae (both right and left ischia, pubes, and ilia); left femur and furcular; most cervical and dorsal ribs; and miscellaneous small bones. The quarry site is still being excavated, so additional bones may be discovered.

TAXONOMY

The Skull Creek Quarry fossil is temporarily referred to here as *Torvosaurus tanneri*, based on its close similarity with the Dry Mesa Quarry type collection at BYU. The Megalosauridae family to which *Torvosaurus* has been assigned is a poorly understood group of theropods, and their interrelationship has frustrated paleontological research for more than a century. The new *Torvosaurus* adds critically needed morphological data to help unravel some of the mystery surrounding the evolutionary history of this interesting group. The newly discovered evidence has already promoted some taxonomic controversy among paleontologists. Dr. Robert Bakker has claimed the Skull Creek Quarry specimen belongs to a new megalosaur taxa, based on the unique morphology seen in the pelvic bones. In contrast, Dr. Mark Loewen feels comparisons with the type and referred material of the BYU collection agrees favorably with *Torvosaurus*. Comparisons with *Saurophaganax* and *Epitsaurus* rex will also have to be made in a thorough study.



Torvosaurus
right illium



Torvosaurus
left ischium

BODY PROPORTION

The relative proportions of the head, body, and tail of the mounted skeleton were dictated by the existing associated elements. However, since the tail in the *Torvosaurus* skeleton is represented by two anterior caudal vertebrae, its length was more difficult to determine. It seemed reasonable that the enormous *Torvosaurus* head would need a larger tail for counterbalance. Based on the only megalosaur with complete tail vertebrae, *Sciurumimus albersdoerferi*, it was speculated that the tail length in other megalosaurs, including *Torvosaurus*, may have likewise been proportionately long—contrasted by derived theropods, with their shorter skull length and long, slender limb proportions. The contemporaneous *Sciurumimus albersdoerferi* is based on a juvenile skeleton from Solnhofen, Germany. Despite its small size, the Solnhofen specimen displays a long axial skeleton and short robust limbs, with a well-developed skull uncharacteristic of an immature individual, more proportional to an adult theropod. Moreover, *Torvosaurus tanneri* and *Sciurumimus albersdoerferi* share some proportional similarities—such as the relative size of the latter's skull to its stocky limb bones—that may not be due to misinterpretation of ontogenetic morphology. Instead, it may represent the primitive condition in Megalosauridae. Hypothetically, a skeleton of a baby *Torvosaurus* would not look much different from the Solnhofen fossil.

Torvosaurus
left pubis

Torvosaurus left
dorsal ribs L1-L7

HIGHLIGHTS

- Unusually robust skeleton
- First associated cranial and post cranial elements.
- Axial vertebrae include cervical, dorsal, sacral and caudal.
- Anomalous fusion of two dorsal vertebrae (see photo of vertebrae 15 & 16)
- Appendicular elements of the hind limbs.
- Complete pelvis with presence of paired fenestration in pubis bones - See photos
- Ischium showing a false jointed end (pseudarthrosis)
- The broad distribution of bones in the skeleton allows overall body dimensions and proportions to be estimated accurately.

Torvosaurus
left maxilla

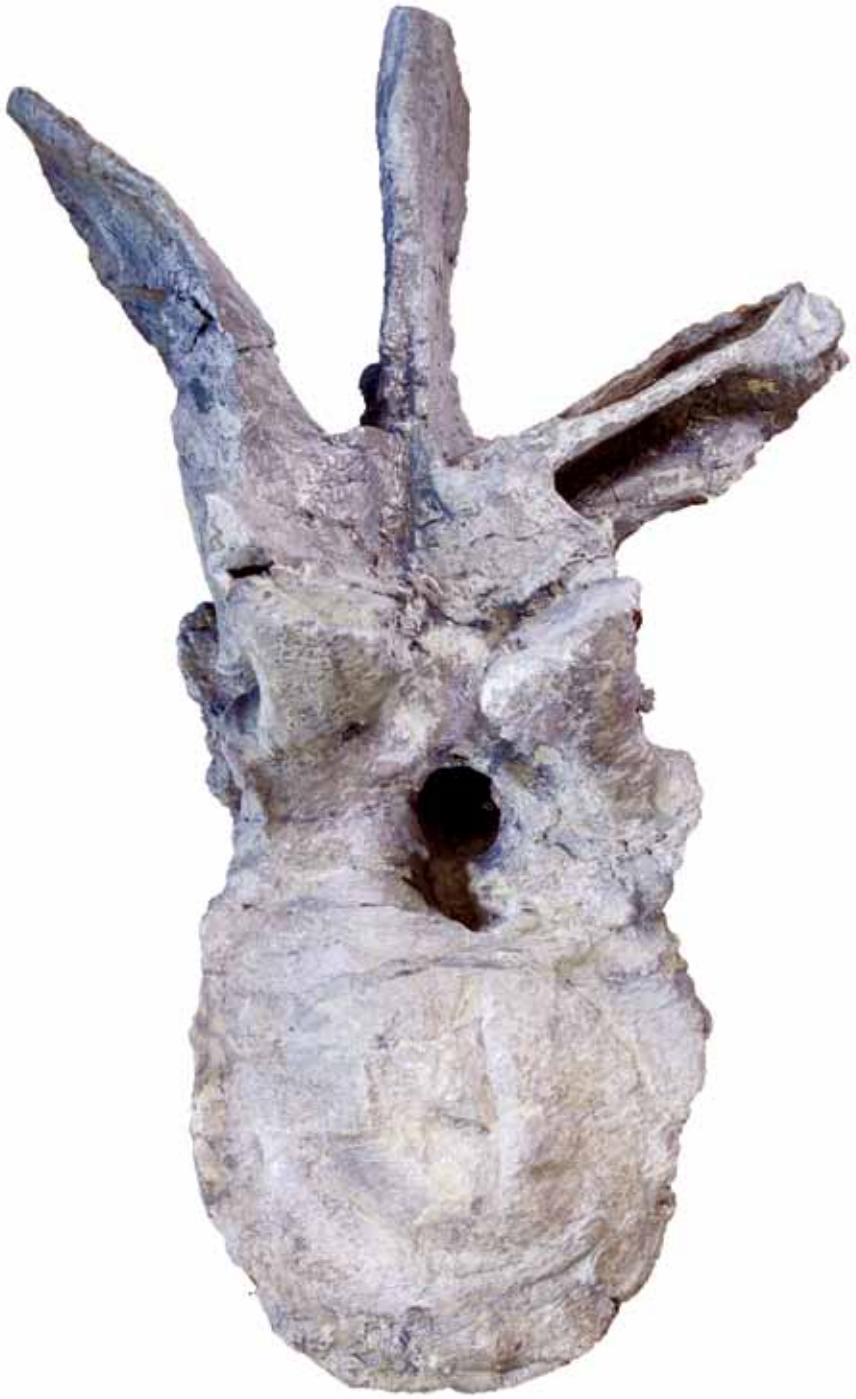
Torvosaurus sacrum

APEX PREDATOR – THE JURASSIC TIGER

Torvosaurus osteology demonstrates that it is a ponderous theropod unlike any other known in the Jurassic, rivaling the largest Cretaceous predators in absolute size. It differs from the coexisting and more commonly found *Allosaurus* in several features, notably the proportional body plan. In *Torvosaurus*, the skull was noticeably large, displaying more elongated jaw bones, as compared to the shorter-faced *Allosaurus*. The maxillary bones in *Torvosaurus* were constructed to suit the long compressed and serrated teeth, which must have acted like steak knives, ready to cut and penetrate deep into flesh. *Allosaurus* teeth, on the other hand, are proportionally much shorter, more numerous, and may have been best used to hold onto prey. The dental comparison between these two carnivores suggests a partitioned niche—where the larger apex species (*Torvosaurus*) may have acted as a solitary hunter, while the smaller species (*Allosaurus*) may have been a member of a pack, possibly employing a mobbing approach in capturing prey. This recalls the same hunting strategies seen in living Tigers (*Panthera tigris*) and Wild Dholes (*Cuon alpinus*), respectively.

Torvosaurus
tooth

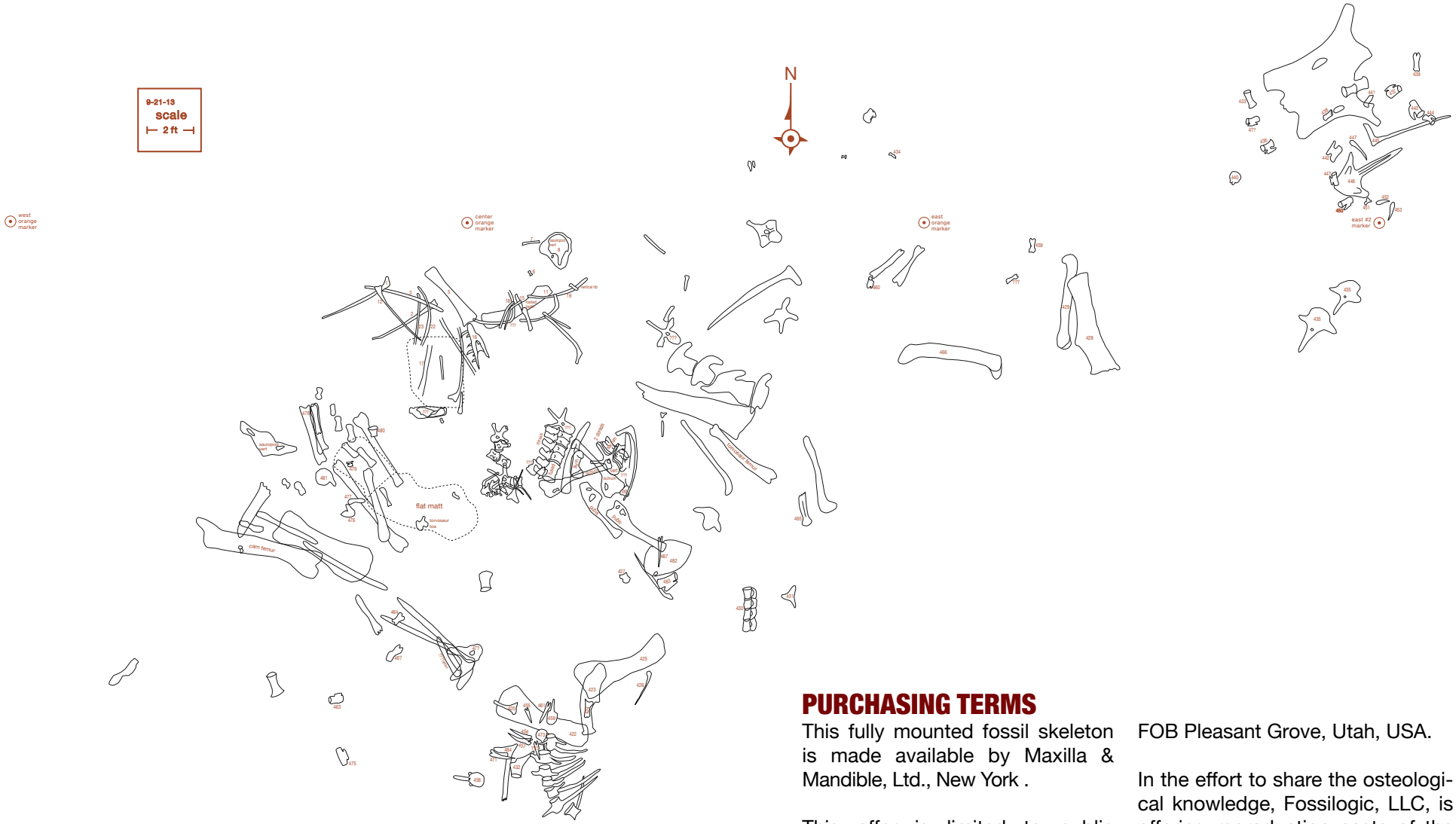
Torvosaurus
vertebrae 15-16



Another remarkable feature, distinguishing the two species, is in the more massive *Torvosaurus* skeleton, which is designed to overpower prey, not to pursue (as would the lighter-built *Allosaurus*)—suggesting again, in speculation, a mode of hunting consistent with that of the roles established by modern Tigers and Dholes. These two share overlapping territory in Asia, but seldom target the same prey, and are therefore not direct competitors.

A basic characteristic feature of living apex predators, as in the Tiger, is that they occur in low-population densities. The rarity of *Torvosaurus* fossil remains may be a reflection of the apex species' dominance in the food web.

QUARRY MAP



PURCHASING TERMS

This fully mounted fossil skeleton is made available by Maxilla & Mandible, Ltd., New York .

This offer is limited to public museums or institutions to assure that the specimen is available for scientific research.

The specimen is ready for immediate delivery.

Price upon request.

FOB Pleasant Grove, Utah, USA.

In the effort to share the osteological knowledge, Fossilogic, LLC, is offering reproduction casts of the skeleton to museum and institutions globally. This must-have, research-quality reproduction incorporates casts of the type material housed at the BYU paleontology collection.

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Torvosaurus skeleton

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